N.A.C.A. BULLETIN

In Two Sections

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EDITORIAL DEPARTMENT NOTE

After a respite provided by the wartime sellers' market, accountants and sales managers are once again preparing to attack the problem of distribution cost analysis and control. Few are fully satisfied with the contribution which the industrial accountant has been able to make in this field in the past. The search for greater understanding, improved techniques, and more useful interpretation of results will be intensified with the growth of sales and price competition. The first article in this issue of the *Bulletin* describes the use of standard distribution costs based on a standardization of sales methods as one solution of the problem of assisting the sales department in the planning, control, and allocating of distribution costs.

WILLIAM E. PERRY, the author of this article, is Controller of the Scranton Lace Co. and National Vice President of N. A. C. A. As a speaker at chapter meetings, regional meetings, and National Conferences, as author of several articles in N. A. C. A. publications, and as National Director in charge of Publications for three years prior to his election as National Vice President last June, Mr. Perry is well known to many N. A. C. A. members throughout the country. His paper on "Distribution Methods and Costs" was presented at the St. Louis Regional Conference last November.

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The suggestion is made in the second article in this issue that a distinction be made between routine maintenance and major maintenance, that routine maintenance be controlled through flexible budget methods, and that major maintenance be provided for and absorbed in costs through a reserve plan. The suggested method is illustrated by a case study of this plan in operation.

THORNTON F. BRADSHAW, the author of this article, is Assistant Professor at the Harvard Graduate School of Business Administration, where he teaches Control, the use of figures in business. A graduate of Harvard College and the Harvard Graduate School of Business Administration, Professor Bradshaw served during the war as Supply Officer on a destroyer and Navy representative to the Trade Agreements Committee in Washington.

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A simplified method of developing budget figures for a small company, based on a classification of fixed and variable costs, is described in our third article. While the method, which is an application of the break-even chart type of analysis, does not provide for the detailed breakdown of costs needed for cost control purposes, it is suggested as a starting point for those companies who have not used over-all budgets in the past and hesitate to undertake the preparation of complete budgetary control plans.

JOSEF GOLIGER, the author of this article, was born in Germany and educated at the Universities of Leipzig, Frieburg and Wuerzburg. He came to this country in 1937 and acquired U. S. citizenship in 1943. He is presently serving as Cost Accountant of the Paramount Woodwork Co. of Milwaukee.

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DISTRIBUTION METHODS AND COSTS

by WILLIAM E. PERRY, Controller,
Scranton Lace Co., Scranton, Pa.

ALL business today is operating under very uncertain and unusual conditions. The period immediately following World War II has been in many ways as trying as the war period. No one can definitely predict future trends and conditions, although most of us feel that after immediate and pressing demands for goods are satisfied we shall go through a short readjustment period when wages and prices will seek a more stable level. This will be followed perhaps by a much longer period of good business. These predictions, of course, are based on the premise that the statesmen of the world manage to prevent the outbreak of another war. If business follows this suggested pattern we shall once again be operating under competitive conditions and business profits will result only by a close watch over selling prices, costs, and efficient operation generally.

The sales departments of industry will welcome a return to competitive business as I am sure they are tired of allocating goods and taking orders instead of selling. During the prewar period industrial accountants contributed much to the manufacturing end of the business through perfection of standard cost and budget procedures. In the postwar competitive period I believe that the managers of our respective sales departments will expect us to make a similar contribution in the field of distribution. In undertaking this work the industrial accountant and his personnel should recognize clearly their function as a service department; they are to assist in creating tools of cost and operation control but the direction and operation of the sales department, the methods used, the sales policies, etc., are still the responsibility of the sales management. With this perspective and the knowledge and experience gained in the factory I am confident that industrial cost accountants can make a valuable contribution to the sales end of business.

Up to the present time there has been a considerable amount of spade work done in distribution methods. Quite a bit of material is available on market analysis, scheduling of salesmen, and salesmen's incentive payment plans. Very little material,

however, has been written on distribution cost control and I draw the conclusion that there is still a great deal of development ahead of us before we can feel that the problem has been mastered.

Functions of the Sales Department

The sales department of the average business has many functions. Direct selling is usually most important and may be accomplished by traveling salesmen, sales offices, catalogues, or direct mail. Salesmen, in addition to selling, are often required to render many services to customers, such as helping them control stocks, set up displays, etc. Most all salesmen are charged with the responsibility of developing new accounts and new markets.

Most concerns today support the direct selling effort with an advertising campaign. While in many instances the actual campaigns are operated by advertising agencies their general supervision and control rests with the sales department.

In addition to securing the orders many sales departments maintain branch warehouses and arrange for the actual delivery of the goods. In these cases the invoicing, credit, and collection functions are usually placed in the sales department. Behind these activities is sales administration, charged with supervising the above functions and responsible for such policies as pricing, discounts, trademarks, brands, packaging, etc.

This brief summary is sufficient to make us realize that distribution is a big and complex phase of business and that its problems require perhaps as much study and attention as has been given manufacturing. Further, if we are to do a good accounting job for the sales department we shall probably need a fair sized sales accounting staff.

Market Survey

The primary essential in approaching the sales department's accounting problem is a good market analysis or survey. The actual survey may or may not be the accountant's job but at least he should be thoroughly familiar with its detail and operation. The market survey is intended to show where the various products can and should be sold. Generally it includes a review of past actual sales experience coupled with an external analysis based on such factors as population, spendable income, number of houses, automobiles, telephones, etc.

Proper organization of the market survey is important if satisfactory results are to be obtained. A good method is to set up a card for each customer showing sales records by products for the past few years. These cards are arranged by towns and the towns grouped by states or territories. The external survey will generally break down the total nationwide market to show the per cent of total that should be developed in each town and city. A study of the internal and external data will result in setting a market potential for each town.

At this point in the survey the potential sales for the entire operation in dollars and product units must be developed. These should be determined by applying current selling prices to the units produced by the factory at normal capacity level, so that the sales department is tied right in to plant operation.

Sales Units and Quotas

Based upon the market survey data, sales management must next break down the product units and related sales dollars to the respective towns in which it is expected to sell the product. Once the dollar sales quota has been determined for each town it can, if desired, be further split over the customer outlets in the town. If this is done the company's policies in respect to credits, types of outlets desired, confinement of lines, etc., must all be considered and interpreted into the picture.

In this way the quota for each town is determined by first having sales management allocate units of the various products to the town and from them develop the dollar quotas. This approach seems more desirable than simply allocating sales dollars, as certain types of products may sell well in one part of the country and have practically no market in another, due to customs, climate, and other factors. One of these factors concerns the degree of sales resistance to one type or style of product encountered in a territory. This difference in sales resistance is not always in relation to the sales price, and consequently is not properly reflected when only sales dollar quotas are used. If there exists a material difference in the salability or sales resistance between the various products, it is advisable to build up a weighting table to reflect this difference and apply this table to the actual product units. The number of units thus determined is referred to as "sales units," and frequently is a better basis for standards than the straight sales dollars.

The foregoing is a very brief discussion of development of a market survey. However, when this job is properly done it results in a well founded basic plan of sales operations. The survey intelligently develops where the market for the product exists, shows up weak spots, lays out the management's quota for each city and town to be covered, and if desired, breaks down the town quota to customers. If the product units have been weighted to reflect sales resistance the survey will also indicate the sales effort required to sell the quota assigned.

The Sales Call

The next essential step in sales planning is also entirely a problem of sales management and not accounting, viz., setting up a job standard for the salesman's call on the customer. It is, of course, realized that when two human beings come into such a contact they are not going to follow completely any standard pattern of behavior. Nevertheless, it is important that the salesman understand what ground he is expected to cover on a customer's call. This involves management's ideas of the best presentation of the product, showing actual samples, models, photographs, etc. In addition to getting the order, many firms require their salesmen to assist the customer with respect to his merchandise inventory, department or window displays, and even in training salespeople. Others expect the salesman to check on the retail prices of their goods and report on competitors' products and prices. At any rate, the sales call should be well defined and a time factor established which is sales management's opinion of *the average hours* or minutes required to make a call and proper sales presentation. If there are different types of salesmen in different markets, a standard length of time per call should be established for each type.

Preplanned Coverage

With the town and customers' quotas established and the standard sales call time set we are now ready to lay out a territory for each salesman. The objective in mind is to give each salesman a territory which contains enough work to keep him busy, is in proper proportion to the work assigned other salesmen, and also provides adequate contacts or calls on the customers. This brings us to the question, "What is adequate contact with the customer?" We recognize at once that some large customers,

such as department stores in lafge cities, must be called upon much more frequently than smaller customers, such as a specialty shop in a small town. This problem of frequency of call must be decided by sales management. Some managements feel that if a salesman makes a town he might just as well call on all the customers in the town. Others take the view that it is more economical to call on a customer only as often as it is necessary. If the first viewpoint is taken all the customers in any one town will have the same call frequency per sales season; if the second viewpoint is followed then some large customers in a town might be called on six times in a season, while some smaller accounts in the same town might receive only two or three calls in the same period. Once the policy is set the frequency of call can be posted to the customers' market survey cards and the total calls per sales season determined for each town.

Territories

Now we are ready to lay out the salesmen's territories, working from the market survey cards. If there is nationwide distribution the planning generally begins at one coastline and territories are progressively worked out across the country. If the sales season is a six-month period and a salesman is scheduled for a five-day week he has 1,040 working hours available. A standard miles per hour travel speed is set and an estimate of travel time hours is deducted from the total working hours, leaving the remaining hours for actual selling contacts. The standard time per call divided into this figure gives the number of calls the salesman can make. Now the preplanning of the salesman's territory and travel schedule really begins. The planner carves out of the market survey a group of towns which will add up the total calls that this salesman can make. Then with a good map showing mileage, a series of colored pins to represent difference frequencies, and some string to show line of travel, he goes to work. I shall not attempt to describe the detailed technique; however, the final result would be something like that shown in Exhibits 1a and 1b, a series of planned trips through the territory, each trip list showing the towns to be covered in proper sequence, the number of calls in each town, and the mileage between each town. A summary of the territory shows the number of calls to be made in the season and the mileage to be covered.

This method of laying out territories and preplanning of travel schedules is repeated, working across the country, until all the territories have been completely planned for adequate coverage.

Salesmen's Reports

So much for organization; now let us take a brief look at reporting media and office records. The salesman has a production job to do and we should not burden him unduly with reports.

MASTER ROUTE PROGRAM

TERRITORY Northern Illinois

SALESMAN B. W. Smith

Eff. 10/20/41
Spring 1942

ROUTE SCHEDULE	APPROXIMATE NO. OF WEEKS
Trip 1 - Northern Illinois	1 1/2
Trip 2 - Central Illinois	2 3/4
Trip 3 - Central & Southern Iowa	3/4
Trip 4 - Northern Illinois, Northeastern Iowa	1 3/4
Trip 5 - Iowa & Nebraska	2 1/2
Trip 6 - Central Illinois	2 1/2
Trip 7 - High Spot - Central & Western Iowa	1
Trip 8 - High Spot - Northern Illinois, Northeast Iowa	2 1/2
Trip 9 - High Spot - Central Illinois, Southeast Iowa	2 1/2
Trip 10- Central & Western Iowa, Nebraska	2 1/2
Trip 11- Northwestern Illinois, Northeastern Iowa	1 1/2
	21 3/4

EXHIBIT 1a

MASTER ROUTE PROGRAM

TERRITORY Nopthern Illinois

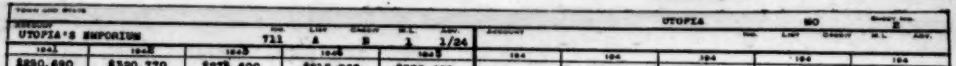
SALESMAN B. W. Smith

ROUTE Trip 1

Eff. 10/20/41
Spring 1942

TOWN SCHEDULE	Route	NUMBER OF CALLS	APPROXIMATE NO. OF MILES FROM LAST TOWN
Clinton, Iowa from Iowa City	A	3	89
Savanna, Illinois	A	1	20
Sterling	A	2	44
Dixon	A	2	14
Freeport	A	3	37
Rockford	A	8	28
Sycamore	A	1	39
DeKalb	A	6	6
Morris	C	1	54
Kankakee	B	2	42
Streator	C	2	56
Ottawa	C	1	16
La Salle	C	1	15
Oglesby	C	1	2
Kewanee	C	3	58
Muscatine, Iowa	C	3	82
(Muscatine to Iowa City)			40
		40	642

EXHIBIT 1b



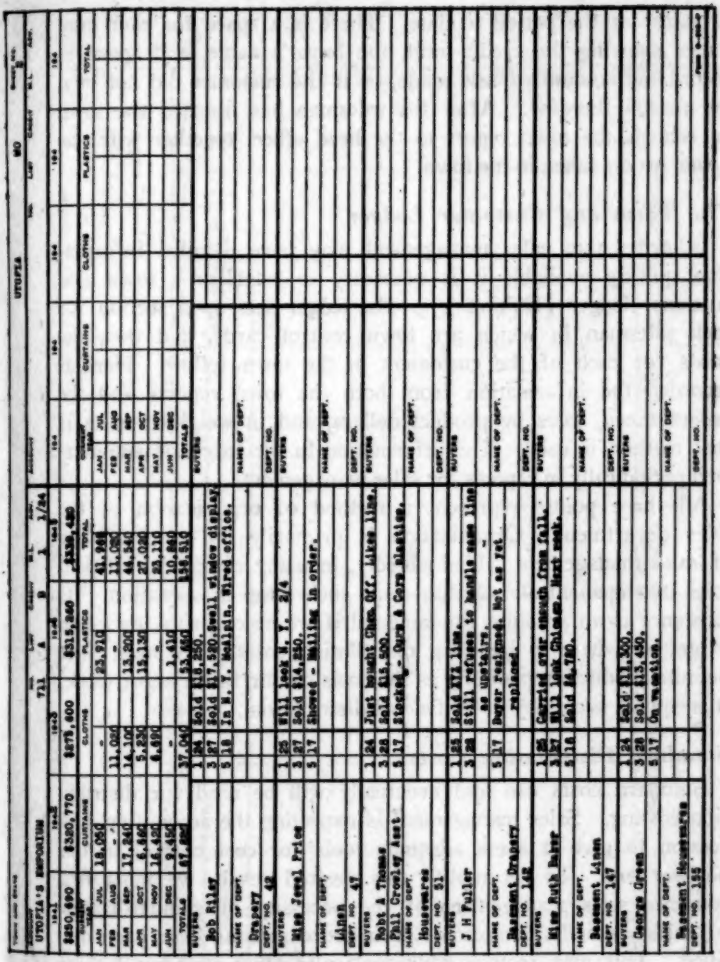


EXHIBIT 2

However, we must get sufficient information for proper control of activity and to measure results. The principal medium used is called a town report (Exhibit 2). This is prepared in the office for the most part, so that the salesman only has to fill in results of his work. The reports are mailed so as to meet the salesman when he arrives in the town. It shows the sales experience in the town for several years past, the current quota, and the amount

of sales for the period to date. There is a space for each customer showing the credit limit, the buyer's name, and space to record the amount of sale made, or if the customer did not buy, the reason therefor. After the salesman has finished the town he returns the town report to the head office, together with the actual orders taken in the town.

The Town and Customer Ledger

In order that sales management may have detailed information quickly available it is necessary to establish a town and customer ledger (Exhibit 3). The ledger sets up a section for each salesman in which are town control cards, and then the cards for each of the customers in the town follow. Here is recorded the information from both the town reports and the orders taken, sales by product dollars, and in weighted units if that method is used. The information in the ledger is summarized periodically in reports for sales management.

All these points represent a method of organization of the sales department. Organization is primarily the responsibility of sales management. Undoubtedly, in many companies efficient sales management already has some such setup in operation. Its existence is an absolute fundamental if we accountants are going to get anywhere in handling distribution costs. We must have definite production planning as the basis of our factory cost work; it is equally necessary in the field of distribution.

Standard Distribution Costs

Standard costs can and eventually will be used for distribution costing. Sales management is expecting the accounting profession to give it some adequate tools for cost control in this postwar era. To accomplish this desired result, we must first convince sales management of the necessity of standardization of sales methods along some such procedures as have been outlined. This may require additional sales office staff but I think we can point out that similar expenditures in the factory for methods, planning, and production control have paid off in results obtained. Presuming that we have cooperation in respect to standardizing sales methods, we accountants can eventually work out satisfactory standard costs in the field of distribution and give to sales management the desired tools for cost control.

TOWN AND CUSTOMER LEDGER

TOWN AND CUSTOMER LEDGER

CUSTOMER
FILE NO.
REMARKS:
LIST
CREDIT
M. L.
TOWN
QUOTA
POPULATION
CHAINS
TERRITORY NO.
FREQ.

YEARLY TOWN AND CUSTOMER TOTALS	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950

DATE	ORDER NO.	TOTAL AMOUNT OF ORDER	HOTTINGHAM DIVISION						SHOWER CURTAIN DIVISION		MONTHLY TOTAL
			PAIRS	PANELS	NETS	COVERS AND SCARFS	JOBS	SHOWERS	REGULAR	OTHER	

INACTIVE AND OTHER ACCOUNTS NOT SOLD

ACCOUNT OR PROSPECT	FILE NO.	LIST	CREDIT	REASONS

Form A-1000-F
Rev. 12-46

EXHIBIT 3

Some of the cost methods developed for factory use can be applied equally well in the sales department. First there is the matter of standard normal capacity. In factory accounting we develop normal capacity as the prime basis of our costs, translating it into equivalent units of product. We should bring these normal capacity units over into the sales department as the prime basis of sales standards. They can be translated into sales dollars by applying current prices, or into "sales units" as previously described, into weights or cubic volumes for warehousing and delivery departments, and into other cost absorption bases as required. Further, this ties the sales and the factory cost basis together into a unified whole.

Departmentalization

Next it seems only natural that we should utilize the generally accepted factory cost principle of charging costs to the person directly responsible for incurring or controlling them. This means setting up various departments as required, both productive and service, and recording in each department in proper detail the items of cost as incurred. The direct selling or productive departments would be all those engaged in actually selling or handling the product, and in our account classification we would establish separate accounts for each salesman, each branch office, each warehouse, and the catalogue or direct mail department. The service departments might include advertising, sample, invoicing, credits and collections, general office, and sales management.

The third factory cost principle which can be utilized in the distribution field is that of tracing all costs to the point where they can be ultimately applied to the product, as it is from the sale of the product that costs must be recovered. Following this principle, we should carefully study each service department and develop an acceptable basis for prorating or spreading its cost to the various direct selling departments. These service department charges will become burden charges against each sales territory, branch selling office, etc., and be applied against the products at that point.

The last factory cost principle in the distribution field is that of control through measuring actual costs against standard allowances and determination of variance. Control through variance

accounts has been most successful in our factory work and its possibilities are equally good in distribution.

Standard Costs for Salesmen

Having outlined the general cost principles to be used, let us discuss their application in this field. The most important costs generally are those pertaining to the salesmen (Exhibit 4). Going back to the market analysis and the preplanned travel schedules, we have available the work load planned for each salesman. The market survey expresses the work load in terms of sales dollars and sales units, while the preplanned schedule expresses it in terms of total customers' calls and travel miles. What should be the standard costs allowed to do this work?

First let us consider salesmen's compensation. Many companies have in effect excellent incentive plans for salesmen's compensation. One plan, for example, uses 4 per cent of the sales quota for the territory as the base salary. It pays the salesmen a guaranteed minimum of 85 per cent of base salary for selling 70 per cent of quota or below, and then pays at the end of each sales season an additional 1 per cent of base salary for each 2 per cent of sales over 70 per cent. A top limit is set at 115 per cent of base salary for selling 130 per cent of quota or better. This plan provides not only for incentive but establishes an equitable basis for fixing salaries in all territories.

Standards can also be set for salesmen's travel expenses. If automobiles are used a cost per mile can be worked out and a standard allowance set which probably can be used for all territories. Standard living costs per day can be established, although it is generally considered most equitable to set a standard for each territory.

Salaries and travel expenses generally make up the direct costs of operating a salesman's territory. A proration from each of the service departments will make up the burden charge and the result is the total standard cost allowance for covering the territory for the sales season. Now let us compare this cost allowance with the standard work load and develop the standard performance and product rates. Incidentally, the product rates can be developed either on the sales quota dollars or the sales units, whichever seems best to represent the selling effort. In Exhibit 4 sales units are used.

STANDARD COST ALLOWANCE AND RATES

SALES TERRITORY NO. 2

Item of Cost		Amount	Total
STANDARD WORK LOAD			
Market Survey	- Quota for Season	$100,000	
Market Survey	- Sales Units	200,000	
Preplanned Schedules	- Calls	1,000	
STANDARD COST ALLOWANCE			
Salary	- 4% of Quota	$ 4,000	
Travel Expenses, Living	- 120 days @ $8.00	960	
Travel Expenses, Auto	- 20,000 miles @ $.04	800	
Direct Costs			$5,760
Share of Advertising		600	
Share of Sample		60	
Share of General Office		400	
Share of Management		140	
Burden Cost			1,200
Total Standard Cost Allowance			$6,960
STANDARD RATES			
Direct Costs			
1. Total Direct Cost		$ 5,760	
Total Calls		1,000	
Standard Cost Per Call		$ 5.76	
2. Total Units		200,000	
Total Calls		1,000	
Total Standard Units Per Call		200	
3. Standard Cost Per Call		$ 5.76	
Standard Units Per Call		200	
Standard Cost Per Unit		$ .0288	
Burden Costs			
1. Total Burden Cost		$ 1,200	
Total Units		200,000	
Standard Burden Cost Per Unit		$ .006	

EXHIBIT 4

Standard Rates

The first standard rate in Exhibit 4 is the direct cost per sales call; it is obtained by dividing the total calls scheduled for the season into the direct cost allowance for the same period. The next step is to develop the standard units per call. This is done by dividing the total sales units by the calls scheduled. The standard rate for each sales unit is the result of dividing the standard

VARIATION ANALYSIS

SALES TERRITORY NO. 2

Item of Cost	Standard	Actual	Variance
PERFORMANCE			
Calls	167	150	- 17
Units	33,333	36,000	+ 2,667
COST OF OPERATION			
Direct - 36,000 Units @ $.0288	$1,037		
Salary		$ 660	
Living Cost		180	
Travel Cost		110	
	1,037	950	+ 87
Burden - 36,000 Units @ $.0060	216	190	+ 26
	$1,253	$1,140	+ 113
ANALYSIS OF VARIANCES			
Effort			
- 17 Calls @ Std. Rate $5.76			+ 97
Results			
+ 2,667 Units @ Std. Rate $.0288			+ 76
Cost Control			
150 Calls @ Std. Rate $5.76	$ 864	$ 950	- 86
Total Variance			+ 87

EXHIBIT 5

cost per call by the standard sales units per call. These three sets of standard rates are based on the direct costs of the salesman and are used in measuring his activities and results. The burden cost rate is based only on the sales unit, and is obtained by dividing the total burden cost by the total units to be sold in the sales season.

Salesmen's Variations from Standard

Exhibit 5 shows how the standards applicable to salesmen are used in month-to-month operation. The performance for the month is shown at the top of the exhibit, indicating that this salesman made seventeen calls less than his schedule called for, but was successful in disposing of 2,667 units more than his quota. The amount of cost covered by the standard is determined by multiplying the units sold by the direct standard rate per unit, and also by the burden standard rate per unit. The actual costs would come from the salesmen's account in the accounting department's cost ledger and the variances, of course, are the difference between standard and actual.

In the example the direct variance is a gain of $87. Using our standard schedules and rates we can analyze this total variance and get a picture of this salesman's performance. In the first instance he made seventeen calls less than schedule, or that much less selling effort, and while it created a variance gain of $97, is nevertheless only a partially satisfactory performance. On the result factor he was much better, exceeding his quota by 2,667 units, a gain of $76. The third factor, cost control, indicates that 150 calls at standard rates should have cost $864, but actually cost $950, or a loss of $86. This loss due to costs can be further broken down into its components, salary and living and travel costs, by using the standard rates set for these factors. In this variance analysis I have put the emphasis on the call as the important factor of control. However, some sales managements might be quite content to measure all factors on the sales unit basis. If this viewpoint is taken the variance analysis would be made by breaking down the standard unit rate into its component parts and applying each to the sales units.

Other Productive Departments

In addition to the salesmen, there are other production departments in the sales division, and I would like to review briefly the development and use of standards in these operations. Branch sales offices are handled exactly the same as salesmen, substituting a standard number of office calls instead of field calls. Where catalogues or other direct mail contacts are used, each catalogue or mail piece is considered a call. A sales quota is set for the catalogue department in dollars and sales units. Dividing the

total sales units by the number of catalogues to be issued, a standard number of units per catalogue is set. The units per catalogue, divided into the cost per catalogue, produces a standard rate per sales unit for the catalogue department. The month to month use of these standards parallels the salesman's procedure previously described.

There is one other phase of productive sales work, warehousing and delivery. Here we are dealing with an operation quite similar to those found in the factory and I am sure we will not have any difficulty in setting standards.

Service Departments

In the service departments (advertising, samples, office, sales management, etc.), the cost allowance for each is determined by a study of historical costs, adjusted for actual or planned changes made by sales management. For the purpose of building standard cost rates these service department costs are prorated over the various direct selling departments, and a burden standard per sales unit developed in each salesman's territory, each branch office, catalogue department, etc.

In month-to-month operation this burden rate in each productive department is applied to the sales units to get the burden earned. This figure in each direct selling department is added to determine the total burden cost for the month, which is covered by the standards. The resulting total standard burden earned is compared with the total actual cost of the service departments, and the variance gain or loss determined. Thus the burden variance is determined without going through the process of monthly prorating. This method of handling sales service departments as a burden cost against direct selling departments is based on the premise that cost recovery of these departments takes place as units of product are actually sold.

Cost Reports

The various cost procedures described are the foundation for some interesting cost control reports to sales management. First, of course, is the monthly departmental statement listing each salesman, office, warehouse, and service department and showing opposite each its actual cost, standard cost, and variance. This report is followed by a series of variation analysis statements for all direct or productive departments, as follows:

1. Sales effort: standard calls scheduled versus actual calls made and variances.
2. Sales efficiency: standard sales units scheduled versus units sold and variances.
3. Sales cost: standard cost allowed for calls made compared with actual costs.

The cost control report is supported by detailed statements, comparing the actual travel costs per mile with the standard cost per mile and the actual living cost per day with the standard living cost allowed.

In addition to the monthly control reports, this type of distribution cost system provides the basic information for a few annual analytical reports which can be quite helpful to management in setting sales policies. Using the standard cost per call and the call frequencies, the cost of servicing each customer can be developed and, on the same basis, the cost for each town. By arranging the sales and gross profit on each customer for the year in order of volume, and comparing the cost of servicing with the gross profit, the trading profit per customer can be determined. At some point in the schedule the volume will become so low that the gross profit will be less than the cost of servicing the account and a trading loss will result. All accounts below this volume level are unprofitable and should be reviewed carefully.

Another annual analysis can be made along the procedures just outlined, substituting towns in place of customers. The unprofitable towns show up in this study, and if a town consistently appears in this category it will probably be eliminated from the travel schedule. Sometimes we can dig too deep for sales dollars, not realizing that the cost is greater than the resultant profit.

The suggestions offered in this paper do not, of course, begin to solve all our problems, but they should stimulate our thinking on this important subject. In due course we industrial accountants can and will do a satisfactory job in the field of distribution costs.

CONTROL OF MAJOR MAINTENANCE EXPENSE

by THORNTON F. BRADSHAW,
Assistant Professor,
Harvard Graduate School of Business Administration, Boston, Mass.

ONE by one the various categories of costs have been subjected to the scrutiny of the cost accountant, and the tags marked "uncontrollable" have been removed and new tags marked "controllable" have been substituted. All problems concerning these costs have not been solved, of course; but in the main, the behavior of labor and material costs, of most of the elements that make up manufacturing overhead, and of some of the components of selling and administrative expense have been studied, and the knowledge of these costs has resulted in practical control applications. By and large, however, maintenance expense does not fall within that favored group of costs. Why has maintenance expense so seldom been admitted to the company of controlled costs?

Certainly maintenance is not excluded because it is typically small in amount and therefore unimportant. Without resorting to over-all statistics, the reader can surely recall a company with which he is familiar and dispel the notion that maintenance expense is small in amount. I have in mind a company with sales of thirty million and maintenance expense of three million. As a matter of fact, maintenance expense is typically large and typically not under adequate control. In general it is uncontrolled because it does not seem to lend itself to control by the techniques ordinarily applied to other costs.

The resistance which costs offer to control depends to a large extend upon the ease of solution of two problems: (1) how easily can we determine how much to spend? (2) how easily can we fix spending responsibility? By both of these standards maintenance can be judged a control-resistant cost.

Past experience affords a poor guide in determining how much is enough. Mistakes in past spending can go undetected for long periods of time. Results of spending are often not visible. How much, for instance, is saved by painting to protect a surface? Too little spending may be as bad as too much. In this area the test of reduced costs is no longer valid.

Frequently divided responsibility heightens the difficulty of the problem. The foreman may be responsible for the run-down condition of a machine, or even for the deterioration of a floor,

but he may have no control over the maintenance men. The maintenance problem bristles with administrative difficulties.

Routine and Major Maintenance

For purposes of practical analysis a breakdown of maintenance expense into two categories, routine and major maintenance, must be made. This is an arbitrary differentiation primarily on the basis of the cost of the individual maintenance job. For instance, all expenditures under $200 might be designated routine maintenance. Typically routine maintenance consists of costs of repairing and renewing hand tools; repairing and replacing cutters, formers, jigs, fixtures, tool holders, punches, dies, office equipment and appliances, etc. Major maintenance relates principally to buildings and durable equipment and might consist of the following: inside painting; replacing inside doors; relaying entire floors; replacing telephone wiring; revamping crane runways, elevators, power supply lines, or ovens; reconditioning industrial ventilation; overhauling boring mills, etc.

This twofold breakdown is essential because a different control treatment should be accorded each of the two categories of expense. In many plants, expenditures for routine maintenance tend to be made each day. The work is done by a maintenance crew directed by a maintenance supervisor or a master mechanic. Control is exercised at the source by a foreman in charge of each department. He is provided with flexible budget bogies, based possibly on past experience corrected by judgment. This portion of maintenance expense is in general subject to the same rigorous control techniques as are most other components of overhead cost.

Theory of Major Maintenance

Maintenance of the working parts of structures is a necessity from the day of their completion until fully worn out in order to obtain maximum manufacturing efficiency. The working parts of a structure consist of those parts which either come into direct contact with the elements or are in direct contact with the occupants of the structure. These parts include roofs, sash, exterior walls, floors and floor coverings; painting, plumbing, and heating installations; electrical system, tracks, exterior paving, fences, etc. These are contrasted with the nonworking and hence nonmaintainable items such as foundations, structural frames, floor slabs, roof slabs, etc. In order to maintain maximum efficiency the working parts must be treated at periodic intervals. The money

expended in maintaining the working parts of a structure can rarely be realized in case of a sale; hence the first consideration in maintenance is to make the least expenditure possible in order to keep the plant or machines on an adequate basis of efficiency.

Once we recognize this essential dichotomy of routine and major maintenance and once we realize that the problem of controlling routine maintenance has largely been solved by the application of well known flexible budget techniques, then we are left free to concentrate on accounting for and controlling major maintenance.

Difficulty of Problem

We all know that the essence of control lies in setting standards, or bogeys, and then providing for an administrative framework to insure attainment of the standards. Gone are the days when a master mechanic could cut the felt on a roof and say, "Time to put on a new roof." Certainly we would not measure the amount of material to go into a product in any such way. But can we plan for the replacement of a roof ten years from now and hold a plant supervisor responsible for accomplishing that task at that time? Planning far into the future always has is difficulties; but for those who prefer to make their mistakes on paper it has its rewards.

Suppose we can determine that a certain building will have specific maintenance requirements during its lifetime. We can then set up a long-term fixed budget. But can we settle upon the cost of a new roof ten years hence? Can we estimate the state of the labor and material market at that time? How rigidly can we follow the budget? Will our working capital position be the determinant rather than engineering need? Will it be better to defer maintenance until a time of high taxes or high profits so that our maintenance dollar will cost less? Shall we plan for maintenance in periods of low productivity so that we can shift men from idle belt lines to painting and scraping work? These questions make control of major maintenance a formidable problem.

A Case Study

Let us see how one company handles major maintenance. For this purpose I have selected a large multiplant company, known for its progressive control methods. I have disguised the company but have not detracted from the reality of the situation. No executive in this company would consider the maintenance problem solved; but none would decry the results thus far obtained.

This company has certain characteristics that influence its con-

trol methods but its objectives are the same as those of any company. How can we be sure of spending the right amount of money at the right time to keep our buildings and equipment in a constant state of efficiency? Their problem, as well as yours, involved determination of the right amount and then administrative action to see that standards are met.

The Carleton Manufacturing Company, one of the country's leading producers of plumbing supplies, operates twelve widely scattered plants. Each plant is considered an autonomous unit, and each plant supervisor has duties and prerogatives akin to those possessed by the president of an independent company. Decisions which affect more than one division are made by the executives in the main office. The central executive staff also performs a number of functions which can be more economically handled at one point, such as legal work and research, and in addition acts as advisors to the division supervisors.

Although each division has its own maintenance superintendent and crew, a director of maintenance in the main office has general supervision over all maintenance. Aided by a staff of maintenance experts and architects, he formulates procedures and may be called upon by plant maintenance superintendents to make outside contracts for large jobs, etc. He exercises no line control over the plant maintenance men.

Routine Maintenance

At an early date the Carleton Company recognized the difference between routine and major maintenance. Departmental budgets had been developed for each routine maintenance account as of varying operating levels. It had been found that routine maintenance tended to vary directly with production. Each foreman in charge of a department was responsible for meeting his routine maintenance budget. The executives of the company believe that this aspect of maintenance control presents few problems.

Major Maintenance: The Reserve Plan

The method of handling major maintenance used by the Carleton Company is designed to accomplish three purposes: first, to allocate maintenance expense to the accounting periods which benefit from the use of the maintained assets; second, to provide standard maintenance allowances for inclusion in standard product costs; third, to control both the time and the amount of the expenditure.

The first two objectives had long been attained to some degree by the use of a maintenance reserve plan. In 1934 each operating division was required to tabulate maintenance requirements over the maximum life of each maintainable asset. For instance, if a building with an estimated life of twenty years needed a new roof every five years then credits were made to the maintenance reserve to provide for the cost of three roofs. If each roof cost $5,000, then the total which had to be accrued over the life of the asset for this particular item of maintenance was $15,000; this figure divided by the number of months (240) gave a monthly accrual of $62.50. All monthly accruals so computed were totaled and the resulting figure was divided by the normal monthly production hours (standard hours) in order to obtain an hourly rate of accrual. The monthly addition to the reserve was computed by multiplying the accrual rate per standard hour for each cost center by the actual hours operated during the month. Actual expenditures were accounted for as charges to the maintenance reserve.

Deficiencies of Maintenance Reserve Plan

The executives of the Carleton Company found the following faults with the operation of the maintenance reserve plan: (1) the validity of relating maintenance to the activity base of standard hours was questionable, particularly in the case of maintenance of buildings, the life of which is a function of time and not of usage; (2) there was no periodic revision of the initial plant audit; (3) there was no check to insure that expenditures were made for the proper items of maintenance; (4) the maintenance reserve plan was essentially an accounting scheme for the purpose of supplying rates for standard product costing and it was not used as a device for administrative control.

With these deficiencies in mind, top management empowered the director of maintenance to embark upon an ambitious program consisting of the following steps:

1. The preparation of a survey of all plants showing the date of installation and cost of each asset, date and cost of last maintenance operation, dates and estimated costs of future maintenance jobs.
2. The preparation of a program of annual surveys of maintenance requirements.
3. The keeping of continuous records on plant maintenance still to be done.

4. The reserve procedure to continue to operate as before but with the continuous plant audit providing adequate data for determining periodically the adequacy of the reserve balance and of annual accrual rates.

Operation of New Plan

As a first step in carrying out his duties, the director of maintenance prepared detailed blueprints of all plants. Keyed to these plans was a maintenance survey which listed each item of maintenance, the plant area affected, date of installation of the asset, date of last maintenance, annual cost of maintenance, and replacement date and cost (Exhibit 1). This of course is an engineering job which requires a good deal of "educated guesswork." The maintenance survey sheets were then totaled for each division for each year (Exhibit 2). Thus the total estimated annual maintenance requirements for a twenty-year period was obtained.

At this point the material was on hand for the computation of standard cost rates and the credits to the maintenance reserve. The director of maintenance had considered one of the weak points of the maintenance reserve system to be the fact that accruals were on a per standard hour basis. In periods of low activity, he argued, the maintenance rate per standard hour times actual hours operated added little to the reserve; during such periods, however, the buildings required maintaining the same as in other years. He preferred to have additions to the maintenance reserve made on a time basis, similar to the way the reserve for depreciation was operated. The management of the Carleton Company, however, did not want to change accounting procedure at this time and decided to continue to make additions to the reserve by multiplying the rate per standard hour by the actual hours operated during the month. Thus, there was no change in this portion of the plan.

Maintenance Budget

The remaining steps constitute the control of maintenance expenditures as separate from accounting for maintenance expense. At the beginning of each year a maintenance expert from the main office visits each division. Using the maintenance survey (Exhibit 1) as a check list, he inspects each item listed as requiring maintenance during the ensuing year and prepares a revised schedule. In general, revisions are made on two counts: (1) deterioration has proceeded faster or not as fast as anticipated; (2) there has been a significant change in the price of material and labor.

WORKS:		DIVISION: "I"		DIMENSIONS: Various							
BUILDING: #1 Warehouse "A & B" Sections		FLOOR SPACE: A - 38847 B - 53696 Total 89,543 S.F.		ERECTED: A - 1917 B - 1908							
SUB-DIVISION NO.	ITEM	AREA - SQ. FT.	DATE INST'D.	LAST MAINT.	SCOPE & COST LAST MAINTENANCE	ESTIMATED MAINTENANCE COSTS COST	RECURRENCE	ANNUAL EXP.	REPLA. COST	REPLA. DATE	LAST INSP. DATE
600	Reinf.conc.fdn.										
	Ext. surface	26165	1908-17	1941			Annual	52			
800	Cement Work										
	Slabs on Ground	17784	"	1944			"	364			
	" Exp.Surface	12162	"								
700	Reinf. Conc.										
	Columns 10#	7000	"								
	Suspend.Slabs	43481	"	1941							
	Ext.Conc.Walls	29395	"	1943	Restoration						
	Conc.Flr.Suspen.	38829	"	1943	Covered except 1426 S.F.						
	Fl.Exp.Surf.	1426	"				"	42			
900	Masonry-Units										
	Tile Part 4 "	1700	"								
	HollowTile	4386	"								
	Gypsum Part 3	3180	"								
	Common Brick	7425	"								
1000	Wood Walks rf.2"	150	"								
	T & G Wd. Par.	4015	"								
	Clg. & Walls Pnt										
	house	16000	1917								
	Flat. Joist	3544 BM	1908-17		2 x 12						
	Flat. Floor	1780	"		3 x 10						
	Maple Flooring	14220	1917	1943	Covered with asph. tile						
	Strus. Wd. Flr.										
	Slabs	19454	1907								
1500	Metal Windows										
	Industrial	4300	1938	1943	Renovated		"	4			
1700	Siding & Roofing										
	Corrug. Metal	8460	1917		?		20 yrs.	85	170	1937	

EXHIBIT 1

"X" Division

Schedule of Estimated Annual Expense and Replacement Cost For 20-Year Period

	Annual Expense	*Replacement Cost*	*Total Estimated Maintenance Per Year*
1945.....	$140,959	$292,128	$433,087
1946.....	"	5,953	146,912
1947.....	"	54,036	194,996
1948.....	"	8,632	149,591
1949.....	"	348,031	488,990
1950.....	"	184,026	324,985
1951.....	"	53,890	194,849
1952.....	"	28,696	169,655
1953.....	"	9,746	150,705
1954.....	"	32,553	173,512
1955.....	"	301,386	442,345
1956.....	"	2,632	143,591
1957.....	"	328	141,287
1958.....	"	280,073	421,032
1959.....	"	131,838	272,797
1960.....	"	97,702	238,661
1961.....	"	275,124	416,083
1962.....	"	83	141,042
1963.....	"	63,757	204,716
1964.....	"	231,372	372,331

Average over 20-year period per year—$261,058

Exhibit 2

Under management policy other than that pursued by the Carleton Company, this revised list of major maintenance coming due might well become a fixed budget for the following year, and the plant supervisors might be held strictly accountable for accomplishing the terms of the budget. However, in the Carleton Company each plant supervisor is in effect the president of his own company and the main office executives combine the functions of a board of directors and a service organization. So using the revised list (Exhibit 3) as a guide, the plant supervisor submits a request for a maintenance appropriation for the ensuing year.

Requests for maintenance appropriations received at the main office are reviewed first by comparing the items on the request with the revised list of maintenance needs made by the representative of the director of maintenance. In the Carleton Company this tool

Location —
Project —1947 Maintenance Program
Project No.—779

Sheet No. 1

PRELIMINARY ESTIMATE

Item No.		Site	Quantity	Rate (material and labor)	Total
1.	(4600)	Remove and replace concrete driveway at N.W. gateway	660 S.F.	$ .80	$ 528
2.	(4600)	Remove and replace concrete curb along driveway adjacent to N.W. entrance to factory bldg.	50 L.F.	5.00	250
3.	(4600)	Repair and resurface black top driveway adjacent to glass chute..	330 S.Y.	2.00	660
4.	(3700)	Paint chain link boundary fence	12600 S.F.	.10	1,260
5.	(1200)	Remove present and replace asbestos siding on hose houses	6 Allow	50.00	300
		Factory and Office Building			
6.	(700)	Replace concrete steps center entrance	80 L.F	3.00	240
7.	(900)	Brick up opening to S.W. elevator shaft from exterior	1.2 M	25.00	150
8.	(1000)	Remove existing maple aisle floor and replace with new maple	3240 S.F.	.55	1,620
9.	(2000)	Mop coat roofs over loading platforms	2800 S.F.	.07	266
10.	(2100)	Repair sheet metal enclosure at air washers in penthouse 8.....	Allow		2,000
11.	(2900)	Remove and replace elevator door Bi-lift type	17 ea.	400.00	6,800
12.	(2700)	Paint exterior pipe railings	300		
		Metal clg., W. platform	2000		
		Silos, glass storage and chute	4000		
			6300 S.F.	.11	693
13.	(3700)	Paint exterior sash, door, etc.	37228 S.F.	.09	3,350

EXHIBIT 3

of control is handled cautiously. In another company possibly control might be localized in the comparison of these two reports.

A second form of control employed by top management at this point is of more universal application. The maintenance appro-

priation requests are reviewed in the light of how well they fit in with (1) the working capital position of the company; (2) the tax situation; and (3) the availability of men and materials to do the jobs. Top management in the Carleton Company exercises considerable direct control over maintenance expenditures if any of the above considerations indicate that a change in plans is desirable.

Conclusion

Many people will argue that since any one of the three factors enumerated above can alter or negate the plans so painstakingly prepared, it would be better to recognize the uncontrollable nature of maintenance expense in the first place. Of course, nothing is by nature uncontrollable, and very few things in business are completely controllable. But scientific management endeavors to decrease the area of guesswork. The Carleton Company systematically prepares plans and establishes administrative methods attaining standards. That certain judgment factors must be applied to these plans is merely a reiteration of the fact that nothing in business can or should be allowed to work mechanically without constant judgment testing.

This company's experience, complicated though it is by a policy of decentralized management, points the way to an effective attack on the difficult problem of maintenance control. The "helpful hints" to be noted are these:

1. Separate maintenance expense into routine and major.
2. Control minor maintenance expense by using the same flexible budget techniques that are successful with other elements of overhead expense.
3. Realistically plan the time and amount of all major maintenance expenditures over the life of the maintainable assets.
4. Account for major maintenance expense by use of a maintenance reserve.
5. Make an annual survey to correct the long-term estimate of maintenance requirements.
6. From this point onward procedure will differ depending upon the management policy of a company. Possibly the simplest succeeding step would be to apply judgment factors to the annual survey and to regard the corrected survey as a fixed budget. This budget would be a commitment of top management just as surely as a routine maintenance budget is a commitment for a foreman.

These stages, tailored to fit your needs and applied within the framework of your managerial policy, may well start you on the road to adequate control of maintenance expense.

SIMPLIFIED BUDGETING FOR SMALL COMPANIES

by JOSEF GOLIGER, Cost Accountant,
Paramount Woodwork Co., Milwaukee, Wis.

MANY small manufacturers are in quest of a simple budget system applicable under their particular circumstances. They cannot operate with the complicated forecast machinery of the large concerns, lacking the costly organization and the experienced staff of specialists. Despite their often very progressive conception of management they are handicapped in their desire to adapt a suitable budget system by the limitations mentioned above. This is especially true of the many small plants which produce special orders or have such a large variety of products that the possibility of establishing a standard cost system is almost precluded. After struggling with these difficulties for some time and attempting a solution by the trial and error method, we finally developed a system which seems to be very flexible in its method and satisfactory in its results. With little preparatory work and with the aid of a simple formula budgeting is now a comparatively easy task which can be handled as a sideline even by the smallest office staff.

Developing Basic Budget Data

The preparatory work in developing the data from which a budget may be prepared follows a fairly familiar pattern.

1. On the basis of past performance (three years' average) with adjustment for important changes, determine the following:
   a. Fixed charges in factory burden.
   b. Fixed charges in selling and shipping expense.
   c. Fixed charges in general and administrative expense.
2. Determine in the same way variable expenses for factory, for selling and shipping, and for general and administrative expense. All semivariable items are broken down in their constant and variable components and these are grouped under the corresponding categories.
3. Determine from past experience the percentage of the variable items of the three groups to net sales, with necessary adjustments.
4. Determine from past performance the percentages of

BASIC BUDGET DATA

Item	Fixed charges	Per cent of sales: Variable expenses	Per cent of sales: Prime cost
Direct Material			40%
Direct Labor			25%
Expenses			
Factory	$55,725	9.5%	
Selling and shipping	5,890	3.5%	
General and administrative	12,350	.3%	
Total	$73,965	13.3%	

EXHIBIT 1

direct materials and direct labor to sales and adjust them, if necessary, for current or prospective variations.

Preparing the Budget

This is all that is needed for a flexible budget. Its construction is now merely a matter of simple multiplication and compilation. Exhibit 1 presents some hypothetical figures to serve as an illustration. Assuming a sales forecast of $490,000 we can construct a forecasted profit and loss statement as shown in Exhibit 2. For the sake of brevity and clarity, inventory variations have been omitted from the exhibit. If a well balanced inventory is maintained they will be negligible. If a larger closing inventory is foreseen the amount exceeding the beginning inventory will have to be deducted from factory cost to determine the cost of sales; if a smaller closing inventory is envisaged the difference between the two inventories will have to be added to factory cost.

Budget Formula

The demonstrated procedure can be condensed into the following formula:

F = Fixed charges.
V = Total variable costs (material, labor, overhead) as per cent of sales.
S = Sales forecast.
C = Total cost.
P = Net operating profit.

FORECAST PROFIT AND LOSS STATEMENT

Net Sales			$490,000
Cost of Sales			
Direct Materials (40% of $490,000)		$196,000	
Direct Labor (25% of $490,000)		122,500	
Factory Burden			
Fixed Charges (Exhibit 1)	$55,725		
Variable Expenses (9.5% of $490,000)	46,550	102,275	
Cost of Sales			420,775
Gross Margin			$ 69,225
Selling and Shipping Expenses			
Fixed Charges (Exhibit 1)	$ 5,890		
Variable Expenses (3.5% of $490,000)	17,150	$ 23,040	
General and Administrative Expenses			
Fixed Charges (Exhibit 1)	$12,350		
Variable Expense (.3% of $490,000)	1,470	13,820	36,860
Net Operating Profit			$ 32,365

EXHIBIT 2

$C = F + (V \times S)$ and
$P = S - C$
or in one formula
$P = S - [F + (V \times S)]$

By substituting the figures in Exhibits 1 and 2, we obtain

$F = \$73,965$
$V = 78.3\%$ of sales
$S = \$490,000$
$C = \$73,965 + (78.3\% \times \$490,000)$
$= \$73,965 + \$383,670$
$= \$457,635.$

$P = \$490,000 - \$457,635$
$= \$32,365.$

Use of Budget Data

One of the important objectives in setting up a budget is its use for purposes of control. The technique is well known and needs, therefore, only a short review. The yearly budget figures, if a year's forecast is constructed, can be broken down into monthly positions. Where the business is subject to seasonal fluctuations the sales trends of the past will indicate the allocations for each month; where business is comparatively stable all year around the annual budget figures can be prorated in twelve equal parts. The monthly figures thus obtained are the basis for the comparison with actual performances. The variances can then be analyzed as to their causes and, if unfavorable and avoidable, corrective action can be taken. If shorter periods for budget control are desired the monthly figures can be broken down further into weekly or even daily figures.

COMING ARTICLES

In the *N. A. C. A. Bulletin*, March 1, 1947

Industrial Research and Its Relation to Accounting
by Mason Smith

Accounting Development Work for a Manufacturing Company
by Thomas W. Spicer

Operating a Systems Department
by T. A. McMullen